ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

Douglas A. Ducey
Governor

Misael Cabrera
Director

via e-mail

March 14, 2016
FPU16-201

Ms. Catherine Jerrard
AFCEC/CIBW
706 Hangar Road
Rome, NY 13441

RE: WAFB – ADEQ Comments – ST012 - *Draft Soil Vapor Extraction System/Steam Enhanced Extraction System [SVE/SEE] Operation and Maintenance [O&M], 2015 Third Quarter [2Q15] Performance Report, Former Liquid Fuels Storage Area, Site ST012, Former Williams Air Force Base, Mesa, Arizona*; prepared for Air Force Civil Engineer Center AFCEC/CIBW, Lackland AFB, Texas; prepared by Amec Foster Wheeler Environment & Infrastructure, Inc., Phoenix, Arizona; document dated December 22, 2015

Dear Ms. Jerrard:

Arizona Department of Environmental Quality (ADEQ) Federal Projects Unit (FPU) and ADEQ contractors UXO Pro, Inc. and Praxis Environmental reviewed the referenced document. General and Specific Comments are provided below.

General Comments

1. ADEQ remains concerned that the contaminant plume is not characterized. Examples include:
   a. Elevated benzene concentrations in perimeter monitoring wells and steam injection on the TTZ perimeter as reported continue to be points of concern that indicate a lack of sufficient containment of injected fluids that may result in the adverse migration of NAPL away from extraction wells.
   b. Benzene concentrations remain elevated in perimeter wells ST012-W34 and ST012-W36.
   c. The extent of LNAPL in the vicinity of wells ST012-W11, ST012-W30, and ST012-W37 remains unknown.

Specific Comments:

1. Page 3-10, Graph 3-1. Please separate Graph 3-1 into two separate plots, one with untreated stream readings and the second with the readings from the thermal accelerator discharges. Both graphs can then be plotted on a linear scale to display more detail. PID concentration trends plotted on the graph are difficult to evaluate when plotted on a logarithmic scale. The anticipated increases in vapor concentration associated with pressure cycling are not apparent in the graph.

2. Section 3.2.1.2.1 Wellfield Vapor Extraction Rate. Please provide a graph with the effluent flow rates from the air strippers and with the influent flow rates to the thermal accelerators.
3. Page 3-11, Line 967, *"The cumulative water extraction is calculated based on flow meters installed at each of the 57 extraction wells."*
    a. Do the individual flow meters provide both instantaneous flow rate and total flow?
    b. If so, which values (rate or total) from the educator inlet and outlet are used to calculate the flow rates and cumulative flows presented in Graphs 3-3 and 3-4?
4. Page 3-16, Graph 3-8. Are the steam injection values presented in Graph 3-8 validated or correlated with measures of water usage in the boilers?
5. Section 3.2.1.2.6. The section presents a general discussion of temperatures measured at TMPs within the TTZs. More detailed information is provided in the Weekly Reports contained in Appendix F.
    a. In the LSZ, the highest average temperature is on the boundary at TMP-7. Heating has also occurred at TMP-2 located over 100 feet from a steam injection well (LSZ-22) and separated from the injection by two extraction wells (LSZ-14 and LSZ-29). Steam breakthrough has not occurred at LSZ-14 or LSZ-29 yet heated conditions remain at TMP-2. For heating to occur as far as TMP-2, the energy (hot water) had to bypass the extraction wells by convection because heating cannot be explained by thermal conduction. NAPL could flow adversely away from the TTZ with the hot water and insufficient monitoring exists to make a determination.
    b. Beyond the southern boundary of the LSZ TTZ, a steam zone exists at TMP-10, which is located over 70 feet from a steam injection well (LSZ-25) and is separated from the injection well by two extraction wells (LSZ-12 and LSZ-36). Steam breakthrough has not occurred at LSZ-12 and steam has not been detected at LSZ-36 since June 15 yet steam remains at TMP-10 and is increasing in thickness. The existence of a thick steam zone at TMP-10 is not consistent with the concept of hydraulic containment wherein external flow is toward the TTZ and not away. Hence, NAPL may be mobilized to the south and insufficient monitoring exists to make a determination.
6. Page 3-20, Table 3-3. Please include a measured vapor flow rate at each location close to the time of sample collection to allow a calculation of compound mass flow rates.
7. Page 3-23, Table 3-4. Please include a measured water flow rate at each location close to the time of sample collection to allow a calculation of compound mass flow rates.
8. Page 3-43, Line 1231, *"Based on operational testing following startup, the eductor motive water pressures and flows were optimized."* What specific optimization led to the cycling of eductor pumps rather than constant, site-wide extraction?
9. Page 3-57, Line 1411. *"A correction factor is applied to thermal accelerator influent PID readings (as presented in Graph 3-1) based on corresponding thermal accelerator influent analytical data (results shown in Table 3-3)."* Please include a table of the correction factors applied for the various time intervals alongside the associated analytical data.
10. Pages 3-58 and 3-59, Graphs 3-18 and 3-19.
    a. Please include updated graphs, similar to those provided with the September 30, 2015 SEE Weekly Report in Appendix F. Graphs 3-18 and 3-19 do not show data after mid-June.
    b. In evaluating the mass removal rate, the data should be smoothed to match more closely actual conditions. In assessing the transition to EBR, the peak value for LNAPL recovery of ~24,000 lbs/day is not appropriate. The peak value for comparison should be an average over several weeks because of the batch process.
11. Page 3-60, Table 3-11. Please include a calculation of the mass dissolved in the water entering the air stripper. The table should report the three mechanisms of mass removal: mass dissolved in extracted water, mass volatilized into extracted vapors, and mass in recovered LNAPL.

12. Page 3-60, Table 3-11. Please add a column for benzene removal by each of the three phases (dissolved, vapor, and LNAPL). The data are available (Tables 3-3 and 3-4) to perform calculations of benzene mass removal in addition to the total hydrocarbon mass removal currently reported in Table 3-11.
13. Section 3.3.2 Containment Evaluations. This section should include an energy balance that is equivalent to a volume balance. As the steam zone grows, a large mass of liquid water is displaced by a small mass of water vapor in the steam zone and the displaced liquid water should be accounted for in the mass balance. As a result, Graph 3-20 is insufficient to demonstrate containment. In addition, site heterogeneity and changes in water viscosity with temperature are not accounted for in the containment evaluation.
14. Section 3.3.2 Containment Evaluations. Comments 23 through 27 provided on the first quarterly report for SEE remain unaddressed and are included by reference to these comments.
15. Pages 3-60 – 3-61, Lines 1459-1474. The discussion of perimeter well benzene concentrations should be moved to a separate subsection under Section 3.3.2 Containment Evaluations.
16. Page 3-61, Lines 1467-1468. *"Historically, benzene concentrations in ST012-W34 and ST012-W36 have been higher than other perimeter wells."* This statement is erroneous, as historical benzene concentrations in well ST012-W34 have generally been below 1 µg/l.
    a. Please revise the text accordingly.
    b. Please provide possible explanations for the increased benzene concentrations. For example, if the groundwater gradient at this location is inward toward the site, then it follows that the increased benzene concentrations may be from areas beyond well W34 that are not sufficiently characterized.
17. Section 3.3.2.1 Water Balance. The mass balance should include a momentum (i.e., pressure) balance to account for soil heterogeneity and well placement. As described in previous comments from ADEQ, the water balance is insufficient to demonstrate containment of injected flow to the defined treatment zone (TTZ) and larger heated zone (HZ).
18. Page 3-64, Lines 1536-1537. *"LNAPL accumulating in these wells during treatment may be the result of changes in hydraulic gradients caused by SEE."* The report should acknowledge that extent of LNAPL in the vicinity of these wells is unknown.
19. Appendix J. Please address the following:
    a. Table J-1. Please add "note 3" to the footnotes; "see note 3" is cited twice in the table, but there is no matching footnote.
    b. The SRL column is missing several entries that should be completed. Please review Arizona Administrative Code, Title 18, Chapter 7 (March, 2009) for the most recent SRLs.
    c. The Appendix includes only a single lab report for samples collected on 9/21/15. Please include the report for soil samples collected on 6/2/2015
20. Appendix L. Provide notation for the location of measures consistent with designations in the Process Flow Diagram in Appendix C of the Work Plan.

Closure

ADEQ may add or amend comments if evidence to the contrary of our understanding is discovered; if received information is determined to be inaccurate; if any condition was unknown to ADEQ at the time this document was signed; or if complementary regulatory agencies bring valid and proven concerns to our attention.

Thank you for the opportunity to comment. Should you have any questions regarding this correspondence, please contact me by phone at (602) 771-4121 or e-mail miller.wayne@azdeq.gov.

Sincerely,

Wayne Miller
ADEQ Project Manager, Federal Projects Unit
Remedial Projects Section, Waste Programs Division

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